

**CITY OF LINCOLN NEBRASKA, STANDARD SPECIFICATIONS**  
**Chapter 32**

**SOIL EROSION & SEDIMENT CONTROL**

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## CHAPTER 32

### SOIL EROSION AND SEDIMENT CONTROL

#### 32.00 DESCRIPTION

- A. This work shall consist of constructing, maintaining, and removing erosion control measures that are used to minimize siltation and sedimentation during construction. This work shall be performed at locations shown on the plans or as directed by the Engineer.

#### 32.01 RELATED WORK SPECIFIED ELSEWHERE

Chapter 2	Earthwork
Chapter 9	Crushed Rock Surfacing
Chapter 20	Construction of Utilities & Structures
Chapter 21	Storm Sewers
Chapter 30	Seeding and Sodding
Chapter 31	Landscape Work

#### 32.02 SYNTHETIC FABRIC SILT FENCE

##### A. GENERAL

Silt fence is a temporary linear sediment filter barrier constructed of synthetic filter fabric and posts. Silt fence shall be used for detaining small amounts of sediment and decreasing flow velocities.

##### B. MATERIALS

1. Filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene fabric and shall conform to the specifications defined in the following table:

Fabric Properties	Minimum Requirements	Test Method
Filtering Efficiency	70%	ASTM 5141
Tensile Strength at 20% (max.) elongation:		
Standard Strength	30 lb./linear inch	ASTM 4632
High Strength	50 lb./linear inch	ASTM 4632
Flow Rate	.2 gal./SF/minute	ASTM 5141
Ultraviolet Radiation Stability	90%	ASTM-G-26

## 32.02 SYNTHETIC FABRIC SILT FENCE

2. Posts and stakes shall be standard “T” steel posts and be a minimum of forty (40) inches in length.

### C. INSTALLATION

Silt/sediment fences shall be placed the same day excavating and/or fill and prior to any site disturbing activities upstream of the fence.

A four (4) inch wide by eight (8) inch deep trench shall be excavated along the line of the fence posts.

Posts shall be driven into the ground to a minimum depth of sixteen (16) inches below the original ground level and at approximately a twenty (20) degree incline toward the upslope side. The posts shall be spaced a maximum of six (6) feet apart for filter fabric not supported by wire mesh and a maximum of ten (10) feet apart for filter fabric supported by wire mesh.

The filter fabric shall be entrenched to a depth of no less than eight (8) inches of overlap and properly sealed according to the filter fabric manufacturer recommendations.

These requirements represent minimum installation requirements and do not replace the filter fabric manufacturer installation recommendation that may exceed these requirements.

For application, design, installation details see City of Lincoln Standard Plan LSP-175 and Section 9.6.2 of the City of Lincoln Drainage Criteria Manual.

### D. MAINTENANCE AND REMOVAL

The silt/sediment fence shall be inspected once every two (2) weeks, within twenty-four hours after each rain event, daily during a prolonged rain event, and as directed by the Project Manager.

Sediment deposits shall be removed when the level of deposition reaches one half (½) of the silt/sediment fence of height. Removed sediment shall be placed in a suitable location and in a manner that minimizes further erosion.

If, during required inspections, damage to the silt/sediment fence is observed the necessary repairs shall be completed within twenty-four (24) hours of the inspection by the Contractor.

The silt/sediment fence shall not be removed until the up slope area has been permanently stabilized and/or directed by the Project Manager. All materials shall be completely removed from the site and stored or disposed of properly.

### E. MEASUREMENT AND PAYMENT

Installation shall be paid for at the contract unit price per linear foot (LF) for “SYNTHETIC FABRIC SILT FENCE INST”. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the installation work.

E. MEASUREMENT AND PAYMENT (Continued)

Maintenance shall be paid for at the contract unit price bid per linear foot (LF), per occurrence for “SYNTHETIC FABRIC SILT FENCE MAINT”. This price shall be full compensation for any and all labor, tools, equipment and incidentals necessary to complete the maintenance activities listed in Section 32.02.D above.

32.03 CONSTRUCTION ENTRANCE

A. GENERAL

A construction entrance is a stabilized stone pad with a filter fabric underline located at any point where vehicular traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk or parking area. Its purpose is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets. It should be used wherever traffic will be leaving a construction site and move directly onto a public road or other paved area.

B. MATERIALS

1. The stone shall be two (2) inch to three and one-half (3 ½) inch diameter, clean crushed rock or recycled concrete.
2. Filter fabric shall be resistant to commonly encountered chemicals, hydrocarbons, mildew, rot-resistant, and conform as a minimum to the fabric properties shown in the following table.

Fabric Properties <sup>1</sup>	Light Duty <sup>2</sup>	Heavy Duty <sup>3</sup>	Testing Method
Grab Tensile Strength (lbs)	180	250	ASTM D4632
Elongation At Failure (%)	50	60	ASTM D4632
Mullen Burst Strength (psi)	250	380	ASTM D3786
Puncture Strength (lbs)	90	125	ASTM D4833
Apparent Opening Size (mm)	.20	.20	ASTM D4751

<sup>1</sup> Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

<sup>2</sup> Light Duty entrance shall be defined as sites that have been graded to multi-axle truck. Examples of fabrics which can be used are: Trevira Spunbond 1125, Synthetic Industries 701, Polyfelt TS650, or equivalent.

<sup>3</sup> Heavy duty entrance shall be defined as sites with only rough grading and where most travel would be multi-axle vehicles. Examples of fabrics which can be used are: Trevira Spundond 1135, Synthetic Industries 1001, Polyfelt TS750, or equivalent.

## **32.03 CONSTRUCTION ENTRANCE (Continued)**

### **C. INSTALLATION**

The minimum width of the entrance shall be twelve (12) feet for sites with multiple access points and twenty-four (24) feet for sites with a single access point. The minimum length of the entrance shall be seventy (70) feet.

The area of the construction entrance shall be excavated a minimum of three (3) inches and shall be cleared of all vegetation, roots, and other objectionable material. The filter fabric shall be placed the full length and width of the construction entrance.

Following the placement of the filter fabric, the stone shall be placed over the entire length and width of the construction entrance at a thickness not less than six (6) inches. A three (3) foot wide by six (6) inch high hump of additional stone shall be placed across the entire width of the construction entrance at the connection to the existing street or paved area.

For application, design, and dimension details refer to Lincoln Standard Plan LSP-176 and Section 9.6.8 of the City of Lincoln Drainage Criteria Manual.

### **D. MAINTENANCE AND REMOVAL**

The entrance shall be maintained in a condition which will prevent tracking or flow of sediment onto public right-of-way . This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand and repair and/or cleanout of any structures used to trap sediment.

Inspections shall be made at least once every seven (7) calendar days and after any storm even of greater than 0.5 inches or precipitation during any 24 hour period.

All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstances.

The construction entrance shall not be removed from the site and maintenance shall not cease until the site construction is sufficiently complete such that exiting traffic will no longer track material onto the public street or paved area. All filter fabric, stone surfacing, and any other materials used in the construction of the entrance shall be completely removed from the site and disposed of properly.

### **E. MEASUREMENT AND PAYMENT**

Installation of the construction entrance shall be paid for at the contract unit price per ton for "CRUSHED ROCK SURFACING (IN PLACE)". This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for installation, maintenance, and removal work. The filter fabric shall be subsidiary to the construction of the entrance.

## **32.04 RIPRAP APRON**

### **A. GENERAL**

Riprap aprons are flat beds of crushed rock over geotextile filter fabric installed at storm drain outlets. Riprap aprons are energy dissipation measures that decrease flow velocity to a non-erosive level prior to entering an earthen channel.

### **B. MATERIALS**

1. The riprap shall consist of clean crushed rock or recycled concrete subject to the following requirements: The size of the riprap shall be in accordance with Section 7.6 of the City of Lincoln Drainage Criteria Manual, as shown on the approved erosion and sediment control plan and as directed by the Project Manager; crushed rock must consist of limestone, quartzite, or other hard stone; riprap shall have a density of at least one-hundred forty (140) pounds per cubic foot (lb/CF); riprap shall have no dimension greater than three (3) times its least dimension; recycled concrete shall be clean and contain no asphalt.
2. Filter fabric shall meet the requirements of Section 32.03 of this chapter.

### **C. INSTALLATION**

The area of the apron shall be excavated to a depth such that the surface of the apron is flush with the storm drain outlet and that accommodates the thickness of the apron. The area shall be cleared of all vegetation, roots, and other objectionable material. The thickness, shape, and size of the apron shall be in accordance with Section 7.6 of the City of Lincoln Drainage Criteria Manual, as shown on the approved erosion and sediment control plan, and as directed by the Project Manager.

The filter fabric shall be placed over the entire area of the apron. The riprap shall then be spread evenly over the entire area of the apron and leveled. The riprap may or may not be grouted in place according to the approved erosion and sediment control plan or as directed by the Project Manager.

For application, design, and construction details refer to Section 7.6 of the City of Lincoln Drainage Criteria Manual.

The riprap apron shall be constructed on the same day the storm drain outlet is constructed.

### **D. MAINTENANCE**

The apron shall be inspected once every two (2) weeks, within twenty-four (24) hours after each rain event, daily during a prolonged rain event, and as directed by the Project Manager.

Any riprap and/or filter fabric that has been displaced or damaged in any way shall be re-laid or replaced within twenty-four (24) hours by the Contractor.

Maintenance shall not cease until the entire storm drain system is complete and is given final approval from the City.

## E. MEASUREMENT AND PAYMENT

Installation of the riprap apron shall be paid for at the contract unit price per ton for “CULVERT OUTLET PROTECTION INST”. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating and placing all materials, and for all labor, tools, equipment and incidentals necessary to complete the installation work. The filter fabric and grout shall be subsidiary to the construction of the apron.

Maintenance shall be paid for at the contract unit price bid per each, per occurrence for “CULVERT OUTLET PROTECTION MAINT”. This price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in Section 32.04.D above.

## 32.05 RIPRAP BASIN

### A. GENERAL

Riprap basins are depressed beds of crushed rock over geotextile filter fabric installed at storm drain outlets. Riprap basins are energy dissipation measures designed to decrease flow velocity to a non-erosive level prior to entering an earthen channel.

### B. MATERIALS

1. The riprap shall consist of clean crushed rock or recycled concrete subject to the following requirements: The size of the riprap shall be in accordance with Section 7.7 of the City of Lincoln Drainage Criteria Manual, as shown on the approved erosion and sediment control plan, and as directed by the Project Manager; crushed rock must consist of limestone, quartzite or other hard stone; riprap shall have a density of at least one hundred forty (140) pounds per cubic foot (lb/CF); riprap shall have no dimension greater than three (3) times its least dimension; recycled concrete shall be clean and contain no asphalt.
2. Filter fabric shall meet the requirements of Section 32.03 of this Chapter.

### C. INSTALLATION

The area of the basin shall be excavated to a depth that will accommodate the basin thickness and shall be cleared of all vegetation, roots, and other objectionable material. The basin thickness, shape, and size shall be in accordance with Section 7.7 of the City of Lincoln Drainage Criteria Manual, as shown on the approved erosion and sediment control plan, and as directed by the Project Manager.

The filter fabric shall be placed over the entire excavated area. On both sides and at the tip end, the filter fabric shall be extended a minimum of six (6) inches past the basin edge, entrenched to a depth of four (4) inches and backfilled with compacted soil. At the bottom (outlet) end, the filter fabric shall extend a minimum of six (6) inches from the edge of the basin at finished ground level. The riprap shall then be spread evenly over the entire area of the basin and shaped accordingly. The riprap may or may not be grouted in place according to the approved erosion and sediment control plan or as directed by the Project Manager.



C. INSTALLATION (Continued)

For application, design, and construction details refer to Lincoln Standard Plan LSP-177 and Section 7.7 of the City of Lincoln Drainage Criteria Manual.

The riprap apron shall be constructed on the same day the storm drain outlet is constructed.

D. MAINTENANCE

The basin shall be inspected once every two (2) weeks, within twenty-four (24) hours after each rain event, daily during prolonged rain events and as directed by the Project Manager.

Any riprap and/or filter fabric that has been displaced or damaged in any way shall be re-laid or replaced within twenty-four (24) hours by the Contractor.

Maintenance shall not cease until the entire storm drain system is complete and is given final approval from the City.

E. MEASUREMENT AND PAYMENT

Installation of the riprap basin shall be paid for at the contract unit price per ton for "CULVERT OUTLET PROTECTION INST". This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating and placing all materials, and for all labor, tools, equipment and incidentals necessary to complete the installation work. The filter fabric and grout shall be subsidiary to the construction of the apron.

Maintenance shall be paid for at the contract unit price bid per each, per occurrence for "CULVERT OUTLET PROTECTION MAINT". This price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in Section 32.05.D above.

**32.06 FILTER FABRIC STORM DRAIN INLET PROTECTION**

A. GENERAL

Storm drainage inlet protection is a sediment filter or an excavated impounding area surrounding a storm drain drop inlet or curb inlet. Its purpose is to prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area.

B. MATERIALS

1. Geotextile filter fabric - Filter fabric material shall have a porosity (flow rate) as specified by the plan or directed by the Project Manager. Generally, low porosity fabric shall be used for inlet protection.

**FILTER FABRIC STORM DRAIN INLET PROTECTION (Continued)**

Fabric material shall have a minimum of one year of expected useable construction life at a temperature range of -18° to 49° Celsius.

Fabric material for inlet protection shall conform to the following specifications:

<b>Fabric Properties</b>	<b>Requirements</b>	<b>Test Method</b>
Grab Tensile Strength	0.5 kg/mm (Min.)	ASTM D 5034 and ASTM D 5035
Equivalent Opening Size	300 um sieve (Min.)	ASTM D 4751
Puncture Strength	36 kg (Min.)	ASTM D 751

The following products or their approved equivalent are considered to be acceptable for inlet protection.

<b>Product</b>	<b>Manufacturer</b>
Mirafi 100X	Mirafi Inc.
Terratex SC Propex Silt Stop 901	Webtech Inc.
	Amoco Synthetic Ind.

2. Posts and framing material - Wooden posts and framing boards shall have a cross sectional area of 5 1/4 square inches (standard 2" x 4") or larger. Metal posts shall be standard steel "T" post or approved equivalent.

**C. INSTALLATION**

Stakes shall be spaced evenly with a maximum spacing of three (3) feet around the entire perimeter of the inlet and are to be placed no closer than twelve (12) inches to the nearest face of the inlet. Stakes shall be securely driven into the ground to a minimum depth of twelve (12) inches for wooden stakes and sixteen (16) inches for metal stakes. Stakes shall extend a minimum of eighteen (18) inches above the ground for wooden stakes and twenty-four (24) inches for metal stakes.

Where wooden stakes are used, wooden frames shall be constructed and securely attached to the stakes. One frame shall be flush with the top of the stakes and one frame shall be located approximately four (4) inches above the ground.

The filter fabric shall be cut from a continuous roll to minimize weakness at joints. The bottom of the filter fabric shall be placed in a trench at a minimum depth of six (6) inches and backfilled completely with compacted soil. Filter fabric shall be securely attached to the stakes and frames by staples or wire. The joint be overlapped to the next stake.

A temporary dike shall be placed on the down slope side of the structure in locations that are subject to bypass flow.

## **32.06 FILTER FABRIC STORM DRAIN INLET PROTECTION (Continued)**

The storm drain inlet protection shall be constructed the same day that the storm drain inlet is constructed.

For application, design, and construction details see City of Lincoln Standard LSP-178 and Section 9.6.4 of the City of Lincoln Drainage Criteria Manual.

### **D. MAINTENANCE AND REMOVAL**

The structure shall be inspected once every two (2) weeks within twenty-four (24) hours after each rain event, daily during prolonged rain event, and as directed by the Project Manager.

Sediment deposits shall be removed when the level of deposition reaches one half ( $\frac{1}{2}$ ) of the structure heights. Removed sediment shall be placed in a suitable location and in a manner that minimizes further erosion.

If, during required inspections, damage to the structure is observed the necessary repairs shall be completed within twenty-four (24) hours of the inspection.

The structure shall not be removed until the up slope area has been permanently stabilized. All materials shall be completely removed from the site and stored or disposed of properly.

### **E. MEASUREMENT AND PAYMENT**

Installation shall be paid for at the contract unit price per each for "INST STORM DRAIN INLET PROTECTION". This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating and placing all materials, and for all labor, tools, equipment and incidentals necessary to complete the installation work.

Maintenance shall be paid for at the contract unit price bid per each, per each occurrence for "STORM DRAIN INLET PROTECTION MAINT". This price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in Section 32.06.6 above.

Removal shall be paid for at the contract unit price bid per each for "REM STORM DRAIN INLET PROTECTION". This price shall be full compensation for removal, disposal of structures and any trapped sediment, cleaning the site, and any and all labor, tools, equipment, and incidentals necessary to complete the removal work.

## **32.07 TURF REINFORCEMENT**

### **A. GENERAL**

Turf reinforcement should be used on seeded or planted areas of slopes, drainage channels, shorelines and any other area where vegetation growth and establishment may be compromised due to turf instability. Turf reinforcement may also be used in drainage channels as a permanent measure to increase stability and reduce erosion potential.

### **B. MATERIALS**

1. Rolled turf reinforcement blankets shall consist of rolled blankets made of straw, jute, wood, or other approved organic plant fiber with cotton string or degradable netting to hold the material in flat form.
2. Rolled turf reinforcement mats (TRM) shall consist of rolled three-dimensional polypropylene structure that may or may not be filled with coconut or other approved organic plant fiber.
3. Staples shall be No. 11 gauge or thicker and be at least two (2) inches wide and at least eleven (11) inches long.

### **C. INSTALLATION**

The area to be reinforced shall be graded and shaped according to the approved grading plan or according to the Project Manager. The area shall be relatively free of clods or rocks larger than one and a half (1 ½) inches in diameter.

The area to be reinforced shall be fertilized and seeded according to the approved seeding/planting plan or according to the Project Manager.

On shallow slopes, less than 4H:1V, the blankets or mats may be installed parallel across the slope. On steep slopes, 4H:1V or greater, the blankets or mats shall be installed perpendicular down the slope. In ditches and drainage channels the blankets or mats shall be installed parallel to the direction of flow and in such a manner as to avoid seams along the channel bottom if at all possible. The blankets or mats shall be laid loosely and not stretched over the ground surface.

A six (6) inch wide section of the blanket or mat shall be entrenched a minimum of six (6) inches deep along the entire length of the top of slopes and at the upslope ends of channels and ditches. The trench shall then be backfilled with compacted soil over the top of the blanket or mat. The blanket or mat shall be extended a minimum of forty (40) inches back from the top of the slope or bank of the channel.

The blanket or mat shall be stapled at a maximum of three (3) foot intervals along all edges. Where multiple widths are installed side by side, the adjacent edges shall be overlapped a minimum of six (6) inches with the upslope edge laid on top of the down slope edge and stapled at a maximum of three (3) foot intervals along the entire seam.

For application, design, and installation details see City of Lincoln Standard Plan LSP-179.

#### D. MAINTENANCE

The blanket or mat shall be inspected once every seven (7) days, withing twenty-four (24) hours after each rain event, daily during a prolonged rain event and as directed by the Project Manager.

If, during required inspections, erosion or undermining beneath the blanket or mat is observed, the blanket or mat shall be pulled back and any lost soil shall be replaced and the area shall be reseeded. After reseeding the blanket or mat shall be reinstaled according to Section 32.06 C above. The maintenance shall be completed withing twenty-four (24) hours of the inspection.

#### E. MEASUREMENT AND PAYMENT

Turf reinforcement shall be paid for at the contract unit price per square foot (SF) for "TURF REINFORCEMENT". This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing materials, and for all labor, tools, equipment and incidentals necessary to complete the installation and maintenance work.

### **32.08 TRIANGULAR SEDIMENT BARRIERS**

#### A. GENERAL

Triangular sediment barriers operate by intercepting and ponding sediment-laden runoff. Ponding the water reduces the velocity of the incoming flow and allows most of the suspended sediment to settle out. Water exits the check by flow over the top. Triangular sediment barriers can be used as ditch checks, continuous sediment barriers, culvert inlet protection, and drop inlet protection.

#### B. MATERIALS

1. Triangular sediment barriers shall be triangular in shape, having a height of at least nine (9) inches in the center with equal sides and at least a sixteen (16) inch wide base. The triangular-shaped inner material shall be urethane foam. The outer cover shall be a woven geotextile fabric placed around the inner material and allowed to extend beyond both sides of the triangle at least thirty (30) inches. Standard length of each barrier will be seven (7) feet unless otherwise indicated on the plans.
2. Staples shall be No. 11 gauge wire and be at least eight (8) inches long.

#### C. INSTALLATION

Triangular sediment barriers shall be installed in locations and configuration as shown on the approved erosion and sediment control plan or as directed by the Project Manager.

A four (4) inch wide by four (4) inch deep trench shall be excavated perpendicular to the storm water flow. The trench shall extend in a straight line along the entire length of the proposed triangular sediment barrier installation.

### C. INSTALLATION (Continued)

Each triangular sediment barrier has two aprons: one upstream and one downstream. The upstream apron is the shorter of the two. Place the triangular sediment barrier on the downstream side of the trench. Conform the flexible triangular sediment barrier to the contour of the ground or the geometry of the ditch so that no space exists between the barrier and the ditch bottom. Place the first four (4) to six (6) inches of the upstream apron in the trench and anchor it with one row of staples on eighteen (18) inch centers at the bottom of the trench angled slightly toward the downstream side. Place an additional row of staples on eighteen (18) inch centers and at changes in grade along the full length of the barrier at the upstream edge of triangular portion of the barrier. The downstream apron, (which folds under the base of the triangular sediment barrier) should terminate freely on the downstream side of the triangular silt barrier. No trench is needed for the downstream apron. The downstream apron shall be anchored with two rows of staples placed on eighteen (18) inch centers. One row shall be placed where the downstream apron meets the base of the barrier on the downstream side, and the other row should be placed at the downstream edge of the apron.

At joints between sections of the barriers, the ends of the barrier sections shall be placed such that there is no space between the foam materials. The excess fabric at the ends of the barrier sections shall be extended over the adjoining sections and stapled together along the full length of the joint.

When all the sections have been anchored with staples accordingly the trench shall be backfilled with compacted soil.

The triangular sediment barrier shall be installed such that the elevation of the ground at both ends of the barrier is higher than the elevation of the top of the barrier at the center of the ditch. this prevents the storm water from flowing around the barrier.

Triangular sediment barriers shall be constructed prior to or the same day that land disturbance activities are performed up slope of the triangular sediment barriers.

For application and design details see the City of Lincoln Standard Plan LSP 180.

### D. MAINTENANCE AND REMOVAL

The structure shall be inspected once every two (2) weeks, within twenty-four (24) hours after each rain event, daily during a prolonged rain event, and as directed by the Project Manager.

Sediment deposits shall be removed when the level of deposition reaches one half ( $\frac{1}{2}$ ) of the structure height. Removed sediment shall be placed in a suitable location and in a manor that minimizes further erosion.

If, during required inspections, damage to the structure is observed the necessary repairs shall be completed within twenty-four (24) hours of the inspection.

The structure shall not be removed until the up slope area has been permanently stabilized. All materials shall be completely removed from the site and stored or disposed of properly. All ground disturbed by the removal of the structure shall be graded flush with the surrounding ground and stabilized with vegetative cover.

## E. MEASUREMENT AND PAYMENT

Installation shall be paid for at the contract unit price per linear foot (LF) for “INST TRIANGULER SEDIMENT BARRIER”. This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the installation work.

Maintenance shall be paid for at the contract unit price bid per linear foot (LF) for “TRIANGULAR SEDIMENT BARRIER MAINT”. this price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in Section 32.08.D above.

Removal shall be paid for at the contract unit price bid per linear foot (LF) for “REM TRIANGULAR SEDIMENT BARRIER”. This price shall be full compensation for removal, disposal of structures and any trapped sediment, cleaning the site, and any and all labor, tools, equipment, and incidentals necessary to complete the removal work.

## 32.09 STRAW BALE DIKES

- A. Straw bale dikes are temporary sediment barriers consisting of a row of entrenched and anchored straw bales. Straw bale barriers shall be used for detaining small amounts of sediment and decreasing flow velocities.

### B. MATERIALS

1. Straw bale dikes are temporary sediment barriers consisting of a row of entrenched and anchored straw bales. Straw bale barriers shall be used for detaining small amounts of sediment and decreasing flow velocities.
2. Posts shall be standard steel “T” posts or approved equivalent.

### C. INSTALLATION

Straw bales shall be placed end to end entrenched a minimum of four (4) inches below the ground surface. Loose straw shall be packed into any spaces between straw bales. The bales shall be placed such that the bale ties are oriented around the sides of the straw bales, not the top and bottom, so as to minimize the deterioration of the bale ties.

Each straw bale shall be anchored to the ground by two (2) wooden or steel posts. The posts shall be located approximately six (6) inches from each end of the straw bale on center. The posts shall be driven a minimum of twelve (12) inches into the ground and shall be flush with the top of the straw bale.

Soil shall be backfilled and compacted around the base of the straw bale barrier.

Straw bale dikes shall be constructed prior to or the same day that land disturbance activities are performed up slope of the straw bale dikes.

For design details see City of Lincoln Standard Plan LSP 181 and Section 9.6.3 of the City of Lincoln Drainage Criteria Manual.

#### D. MAINTENANCE AND REMOVAL

The structure shall be inspected once every two (2) weeks, within twenty-four (24) hours after each rain event, daily during a prolonged rain event, and as directed by the Project Manager.

Sediment deposits shall be removed when the level of deposition reaches one half (½) of the structure height. Removed sediment shall be placed in a suitable location and in a manner that minimizes further erosion.

If, during required inspections, damage to the structure is observed the necessary repairs shall be completed within twenty-four (24) hours of the inspection.

The structure shall not be removed until the up slope area has been permanently stabilized. All materials shall be completely removed from the site and stored or disposed of properly. All ground disturbed by the removal of the structure shall be graded flush with the surrounding ground and stabilized with vegetative cover.

#### E. MEASUREMENT AND PAYMENT

Installation shall be paid for at the contract unit price per each for "STRAW BALE DIKE INST". This price shall be full compensation for furnishing, preparing, transporting, delivering, excavating, and placing the materials, and for all labor, tools, equipment and incidentals necessary to complete the installation work.

Maintenance shall be paid for at the contract unit price bid per each for "STRAW BALE DIKE MAINT". This price shall be full compensation for any and all labor, tools, equipment, and incidentals necessary to complete the maintenance activities listed in Section 32.09.D above.

Removal shall be paid for at the contract unit price bid per each for "STRAW BALE DIKE REM". This price shall be full compensation for removal, disposal of structures and any trapped sediment, cleaning the site, and any and all labor, tools, equipment, and incidentals necessary to complete the removal work.